

LABOUR FORCE SURVEY SAMPLE DESIGN

Introduction

The purpose of this paper is to provide information on the implications of changes being made in September 1992 to the sample design of the Labour Force Survey (LFS). It also outlines the current sample design used in the LFS and changes made over the history of the survey.

2. The ABS has been conducting labour force surveys since 1960. The surveys were undertaken on a quarterly basis before February 1978 and have been monthly since then. Estimates derived from the surveys are published monthly in *The Labour Force, Australia, Preliminary* (6202.0) and in the more detailed publication *The Labour Force, Australia* (6203.0). Data are also available on a number of other media such as floppy disk, microfiche and customised reports. More details can be obtained from any ABS office.

Objectives of the Labour Force Survey

3. The main purpose of the LFS is to obtain timely information monthly on the labour force status of the Australian population, thereby enabling labour force trends to be monitored. The LFS classifies the civilian Australian population aged 15 and over according to labour force status — those employed, full time or part time; those who are unemployed and whether they are looking for full-time or part-time work; and those not in the labour force. The major data items can also be cross classified with variables such as age, sex, occupation and industry. The data are compiled according to concepts and definitions recommended by the International Labour Organisation.

Sample design and methodology used in the Labour Force Survey

4. The survey is designed to provide reliable estimates for the whole of Australia. The survey design also delivers estimates for the States and Territories and for a number of regions within States.

5. Since the 1960s, the basic methodology of the survey has remained the same. The survey is conducted using an Australia-wide multi-stage area sample of dwellings, which involves selecting geographical areas and then further selecting smaller areas or units within first stage selections. Two categories of dwellings are separately identified and sampled — private dwellings (houses, flats, etc) and non-private dwellings which include units such as hotels and motels.

6. The sample selection methodology results in each dwelling in a particular State or Territory having the same probability of selection (known as the sampling fraction). The sampling fractions for each State/Territory differ, and are such that the resultant sample yields reliable estimates of the main labour force aggregates for each State and Territory. The sample size is expressed in terms of a fraction (e.g. 1 in 277), rather than as a number of dwellings or persons, because it reflects the way in which the sample of dwellings is selected and because the sample size increases as the stock of dwellings increases.

7. One of the primary requirements of the LFS is to provide a measure of change in the characteristics of the labour force over time, especially month-to-month variations. The most reliable data for assessing change from one month to the next would require information to be obtained from the same sample of dwellings each month. Considerations such as the impracticability of retaining the same respondents continually in the survey require that some of the sample be replaced regularly. This procedure is known as sample rotation. Since the monthly LFS commenced in 1978, approximately one-eighth of the sample has been replaced each month. The sample can be thought of as consisting of eight sub samples (or rotation groups). Thus, one fresh sub-sample (rotation group) is introduced into the sample each month to replace an outgoing rotation group. This rotation generally takes place within the same geographic areas. With the current sample rotation procedures no private dwelling is retained in the sample for more than eight months, yet reliable measures of monthly changes in estimates can be compiled because seven-eighths of the private dwelling sample is retained in consecutive monthly surveys. The availability of this matched sample also permits the production of estimates of 'gross flows' — the number of people who change labour force status from one category to another between successive months.

Method of estimation

8. LFS estimates of persons employed, unemployed and not in the labour force are calculated in such a way as to add to independently estimated counts (benchmarks) of the usually-resident civilian population aged 15 and over. The benchmarks are based on Census of Population and Housing data, adjusted for underenumeration and updated monthly for births, deaths, interstate migration and net permanent and long-term migration. Benchmarks are classified by State/Territory of usual residence, part of State

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of usual residence (metropolitan, non-metropolitan), age and sex, which are known as benchmark cells.

9. Expansion factors or 'weights' are applied to the sample responses to derive estimates that relate to the whole population in the scope of the survey. In essence, weights are calculated each month by dividing the population in each benchmark cell by the number of persons in the corresponding sample cell (with adjustments for persons enumerated away from their State of usual residence). Each sample respondent is then given a weight corresponding to the State/Territory of usual residence, part of State, age and sex cell. Estimates of the total number of persons in the population with a certain characteristic are formed by summing the weights of the persons in the sample with that characteristic. The weighting procedure reduces sampling variability by ensuring that estimates conform to the benchmark distribution of the population by age, sex and geographic area while at the same time automatically compensating and adjusting for any underenumeration or non-response in the survey.

10. The benchmarks are revised periodically when new information becomes available from the most recent Census. Whenever the benchmarks are revised, all labour force estimates that have been produced from the start of the old benchmark period may also be revised. Benchmarks based on 1991 Population Census data may lead to revisions in labour force estimates back to July 1986 (i.e., for all months following the 1986 Population Census, which formed the basis for the benchmarks currently used in the LFS). Such revisions will be published in February 1994, but are unlikely to affect estimates prior to January 1989.

Sample redesign and reselection

11. Use of a constant sampling fraction between censuses has the effect that the number of dwellings in the sample increases as the population grows. While this results in a reduction of the sampling error and therefore an improvement in the accuracy of the survey results (the accuracy of the sample is dependent mainly on the actual numbers sampled rather than on the proportion sampled), it is partially offset by a deterioration in the efficiency of the sample and the estimation process in the period since the previous Census. The additional sample also means that the operational costs of collecting the data increase.

12. Therefore, following each Census the ABS redesigns and reselects the LFS sample to take into account the new information which is obtained from the Census. The sample currently used in the LFS was designed and selected using preliminary data from the 1986 Census but will be updated and reselected using information collected in the 1991 Census.

Changes introduced in previous redesigns

13. As mentioned above, the basic methodology of the LFS has remained the same since the first survey was run in the early 1960s. The main changes in sample design and estimation procedures introduced at each redesign since the LFS commenced can be summarised as follows:

The 1971 Census redesign,

- (a) the introduction of different sampling fractions across States and Territories;
- (b) a reduction in sample size through reducing the overall sampling fraction from 1 in 100 to about 1 in 150.

The 1976 Census redesign,

- (a) the introduction of regional stratification;
- (b) an increase in the Australian Capital Territory sampling fraction from 1 in 200 to 1 in 100;
- (c) the introduction of a 1/8 rotation scheme in the non-private dwellings sample.

The 1981 Census redesign,

- (a) as a result of population growth, the Western Australian sampling fraction was reduced from 1 in 90 to 1 in 100;
- (b) a relocation of caravan parks into the non-private dwelling sample from the private dwelling sample;
- (c) a change in estimation procedure from State of enumeration to State of usual residence.

The 1986 Census redesign,

- (a) a reduction in the overall sampling fraction of about 13 per cent;
- (b) changes to certain regional boundaries in New South Wales, Victoria and Queensland.

Design changes to be implemented in 1992

14. New sampling fractions will be introduced from September 1992 and, overall, will be about 12 per cent lower than the current fractions.

15. Previous and new sampling fractions for each State and Territory are:

	1981 Census redesign	1986 Census redesign	1991 Census redesign
New South Wales	1 in 200	1 in 230	1 in 277
Victoria	1 in 200	1 in 230	1 in 242
Queensland	1 in 140	1 in 160	1 in 195
South Australia	1 in 100	1 in 115	1 in 139
Western Australia	1 in 100	1 in 115	1 in 146
Tasmania	1 in 60	1 in 70	1 in 75
Northern Territory	1 in 100	1 in 115	1 in 75
Australian Capital Territory	1 in 100	1 in 115	1 in 75

16. Based on these new sampling fractions, the number of persons in the sample at the end of 1992 will be about 2,000 (3%) less than at the end of 1987.

17. For the 1991 Census redesign, sampling fractions for the Territories were determined in conjunction with those for the States under a special allocation formula. This process is designed to achieve a compromise between (a) the best fraction for national estimates (a uniform fraction throughout Australia); and (b) the best fractions for State and Territory estimates (fractions which would yield identical sample sizes in each State and Territory). As a result, the sampling fractions for the Territories have increased, while those for the States have decreased.

18. The current redesign has resulted in predominantly long stay caravan parks being treated as private dwellings, whereas, previously, all caravan parks were treated as non-private dwellings. This change will result in an increase in the matched sample which yields estimates of labour force 'gross flows'.

19. Some changes will be made to regional boundaries to achieve consistency with the Statistical Region structure of the *Australian Standard Geographical Classification (ASGC) Manual, Edition 2.1* (1216.0). The ASGC Statistical Regions were set up taking a number of factors into account, including State geography, consistency with other statistical collections, and minimum population levels required to yield labour force estimates of acceptable accuracy.

Implementation of new sample

20. When a new sample is being introduced the temporary reduction in the proportion of common selections in successive months means that the standard errors of the month-to-month movements are higher during the change-over period. In order to reduce the impact of the higher standard errors on any individual monthly movement, the private dwelling sample in urban areas will be phased-in over the period from September 1992 to December 1992. For the most part, one quarter of this new sample will be introduced each month so that, by December 1992, the entire new sample will be in place. Replacement will occur generally at the rotation group level with two groups being substituted each month. Such a pattern of implementation means that any changes to labour force estimates due to differences between the two samples, or any other influences, will be spread over the four months rather than being concentrated in one inter-month period.

21. The new sample for non-private dwellings and for private dwellings in rural areas will be introduced in a single stage in November 1992.

Potential effects on Labour Force Survey estimates

22. Implications for estimates produced from the LFS due to the sample redesign and its implementation are as follows:

- (a) The sampling error overall will increase initially by about 7 per cent over the current level but will decline gradually during the life of the new sample. For State estimates, the initial increase will be about 8 per cent, while for the Territories, there will be a decrease of 19 per cent. There will also be higher standard errors for the estimates of

month-to-month movements produced over the period September 1992 to December 1992 compared with those for the corresponding series produced prior to this period and from January 1993 onwards. Overall, these are estimated to be up to 20 per cent higher than the normal standard errors on monthly movements.

- (b) Analysis has shown that the estimated unemployment rate is marginally higher (less than 0.5 percentage points) for those persons in sample for the first time. Normally, this will not affect the overall estimates of month-to-month movements because the number of persons in sample for the first time does not change significantly. However, during the transition period, there will be about twice as many persons as usual in sample for the first time. This may cause a small upward movement in the estimate of the number of unemployed persons from August to September 1992 and a compensating decrease from December 1992 to January 1993.
- (c) Regional estimates will continue to be available during the new sample implementation period but some regional boundaries will change. In the few instances where the boundaries have changed, regional estimates from September 1992 onwards may not be comparable with those before September 1992. More details regarding the new regions and the changes in boundaries are in *Information Paper: Regional Labour Force Statistics* (6262.0) available from any ABS office.
- (d) Estimates of gross flows on a monthly basis will also be affected by the introduction of the new sample. As the sample is to be phased in two rotation groups at a time the sampling error associated with gross flows estimates will increase during this period. In addition, the methodology used in calculating the gross flows estimates means that the results obtained during the phase-in period will not be comparable with those produced in other periods. These estimates will not be published for this period, but will be available on request.

Summary

23. There is a need to redesign the sample used in the LFS because of changes in size and distribution of the Australian population and the requirement to maintain a statistically efficient and cost effective sample. As part of the redesign the overall sampling fraction will be reduced by about 12 per cent. However, the new sample will be introduced over a four month period in order to minimise the possible effects on continuity of the labour force estimates.

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